lying at the west end of the tectonic line which curves about the Banda Sea. Here again radiolarian flint occurs, as nodules or thin beds in a massive limestone, unconformably overlying "grauwacke." Globigerina beds assist in assigning to this "Buru limestone" a true deep-sea character. Mesozoic molluscan species are known from the later limestones. Typical karang does not seem to have formed freely across the old crystalline rocks of Buru, which remain exposed over a wide area. A consideration of the coast-lines, and of the level nature of the karang formation, leads the author to conclude that the Moluccan region is one of fault blocks and vertical movements (p. 286) rather than of folding. He agrees with Verbeek and with most observers in the Indo-Pacific area that uplift and subsidence of adjacent land masses, and not the retreat of the waters, must be held accountable for the present relations of island-crest and ocean-floor.

A noteworthy feature of Prof. Martin's work is the frequent reference to the soils derived from various types of solid rock. This alone would show the careful spirit in which he has made his observations. As he freely remarks, detail after detail remains to be filled in; but his maps, drawn on a liberal scale, his sections, and the photographic landscapes, give the reader a clear insight into what his journeys have revealed. The Dutch Government, in assisting the publication of the results, has conferred a benefit on geographers as well as on geologists.

GRENVILLE A. J. COLE.

ANOTHER ATTACK UPON DARWINISM.

Mimicry, Selektion, Darwinismus. By M. C. Piepers, Dr. jur. utr. Pp. 452. (Leyden: Brill, 1903.)

THE theory that natural selection is an important if not an all sufficient explanation of the evolution of animals and plants has had to meet the attacks of a few serious and of many frivolous critics. To the former class belongs Dr. Piepers. We may not approve of his methods or agree with his conclusions, but his wide learning, his special knowledge of a single group of animals—the Lepidoptera—and his laborious efforts to disprove the current theories of evolution are sufficient to justify us in classifying him with the serious critics. Many will, doubtless, shrink from the task of reading with care the four hundred pages of closely written text, without illustration, with which his attack is framed and delivered, but every naturalist who has the courage to do so will find in it a great deal of instruction and—may we add without offence?—no little amusement. I would suggest to those who attempt the task to disregard, if possible, certain features of the work which disfigure the text.

The denunciation of modern theories with such expressions as the "mimicry humbug," the "heresies of modern biological science" and "phantasies"; the unmannerly denunciation of such naturalists as Weismann, Wallace, Bates and Poulton; the description of the unwholesome character of the English race which produced and encouraged a Darwin (p. 397), are unusual in a work of permanent scientific value. Nevertheless, the pages are filled with many facts bearing upon the theories of mimicry and protective resemblance which will certainly be of value to the serious student of natural history, whatever his preconceived ideas may be.

To quote one of the many interesting facts bearing upon the questions in dispute, we find on p. 22:—

"Ich habe selbst einen meiner javanischen Raupensucher, obwohl er das Thier selbst gefangen hatte, plötzlich erschreckt die Hand zurückziehen sehen, als eine Raupe von Hebomoia glaucippe L. die er mir zeigen wollte, ihre Schlangen-Mimicry annahm, und das wiewohl diese Raupe viel kleiner ist als die der Chaerocampa- und Parechidnia-Arten, die sich mehr der Grösse von kleinen Schlangen nähern, und deren Aehnlichkeit dadurch auch noch viel stärker ist."

It may seem incredible that a naturalist who has had the valuable experience of observing such interesting examples of mimicry as this can doubt the utility to the species of pronounced mimetic resemblance to poisonous or dangerous animals, but Dr. Piepers explains the resemblance in another way, and denies its protective value.

Some years ago Wasmann described a remarkable resemblance between an ant of the genus Eciton and a beetle which dwells in its nest belonging to the genus Mimeciton. If we deny, as Dr. Piepers does, that this is a true case of mimicry, it must be due either to an independent convergence of evolution (homeogenesis) or to a similarity in development caused by a similarity of external influences. But it is impossible to conceive that either of these explanations can account for such a close resemblance, even in the details of the antennæ, as this ant and this beetle exhibit. Surely, as Wasmann remarks, the old theory of special creation is more reasonable than either of these.

At the time the book was written, Dr. Piepers had probably not seen the very remarkable paper by Mr. Shelford on mimetic insects from Borneo and Singapore which was read before the Zoological Society in London on November 4, 1902. In this paper so many examples are given of insects and spiders that closely resemble other insects and spiders with which they associate that the theory of homeogenesis must be strained to the breaking point to account for them. There may be some justice in the remark that the experimental evidence is not sufficient to prove the theory of the origin of mimetic resemblance by natural selection; but what evidence of any kind can be brought to support the theory of homeogenesis, or the startling effects produced in mimicry by similar environments? Absolutely none. The impartial reader must be struck in reading these lengthy theses with the fact that singularly little experimental evidence is related in the text, and none that really supports the truth of any theory but that of natural selection. There is plenty of destructive criticism of current theories, there are many weighty objections and difficulties suggested, but if these succeed in destroying Darwinismus there is nothing left in the way of theory that has any basis of support. But there is a little evidence of a direct nature which our author has overlooked that supports the theory of natural selec-

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tion. If he refers to the reports of the British Association for 1898 he will find that Poulton and his assistants have proved that the pupæ of *Vanessa urticae* are subject to a severe struggle for existence from birds at Oxford and the Isle of Wight, and that in this case the resemblance in colour of the pupæ to the surroundings is of prime importance in the struggle.

In the face of such evidence as this the statement on p. 386 that it is pure chance which of the seeds of a tree or which of the eggs of an animal survives requires some better proof than we have at present before it is acceptable. The evidence of Guy Marshall in his valuable papers on the bionomics of South African insects adds very materially to the support of the theory of natural selection, and naturalists may rest assured that, notwithstanding the vigour and the ability with which this, the latest, attack upon their trenches has been delivered, the defence of the theory of natural selection is still intact. SYDNEY J. HICKSON.

ASSAYING IN THE COLONIES.

Metallurgical Analysis and Assaying. By W. A. Macleod, B.A., B.Sc., A.O.S.M. (N.Z.), and Chas. Walker, F.C.S. Pp. xii+318; with 109 figures in the text. (London: Charles Griffin and Co., Ltd., 1903.) Price 12*s.* 6*d.* net.

THE aim of this work, as explained by the authors in the preface, is to provide a "graded course of work, leading from simple qualitative analysis up to the technical quantitative methods employed by the modern metallurgical chemist," and is intended to cover a period of three years' laboratory work.

The book is divided into three parts, of which part i., containing 50 pages, deals with qualitative analysis and the properties of gases, and part ii., containing 140 pages, deals mainly with quantitative analysis. Part iii., comprising 118 pages, is subdivided into two sections, the first treating of the ordinary methods of fire assaying, while the second gives an outline of the methods employed in some well-chosen examples of technical analyses.

The authors do not claim any originality of matter, but simply novelty in arrangement which is adapted to meet the requirements of students of schools of mines, "more especially of colonial schools of mines." This distinction between colonial and other schools of mines is difficult to understand, for the work which a qualified metallurgical chemist is required to undertake is independent of the locality in which he has received his training, and if the course of study is to be broad and efficient, a text-book which is suitable for one school of mines will be equally suitable for all. At any school of mines the students must be well grounded in the principles of assaying, so that they can understand, test, and practise any method that is subsequently presented to them.

It is obvious, for example, that the study of assaying should be preceded by a course in chemistry, but this can hardly be included amongst the duties of the instructor in assaying. It would be better that the chapters dealing with such subjects as glass working, the preparation and properties of gases, and elementary qualitative analysis should be omitted, and the matter left to the discretion of the professor of chemistry. Moreover, there are so many excellent text-books dealing with this part of the subject that it seems a pity that the authors should have sought to include it in this volume.

Part iii. has been carefully prepared, and the explanations are invariably clear and concise. Unfortunately, however, it suffers from want of space, and might well be expanded at the expense of some of the earlier chapters of the book. Thus the assay of tin ores is dealt with in a chapter of two pages, and that of lead ores occupies only three pages. Silver also receives three pages, and copper, sulphur, and mercury are dismissed in a short chapter of two pages. In spite of this enforced brevity, however, the authors have made the most of the space at their disposal, and the methods they describe are up to date and trustworthy. No pains have been spared in consulting and quoting from the work of recognised authorities on assaying, but it is doubtful whether the frequent reference to divergent opinions may not, in itself, constitute a source of danger. For example, the student who is told that the length of time required for the fusion of a tin assay by the cyanide method is variously estimated by different writers at from 3 to 30 minutes may be tempted to think that he also can vary the time of fusion within these limits, and still obtain satisfactory results. The importance of uniformity in working cannot be too strongly impressed upon the beginner.

The mistakes are remarkably few and unimportant, and the publication of this volume tends to prove that the teaching of metallurgical analysis and assaying in Australia rests in competent hands.

OUR BOOK SHELF.

The Direction of Hair in Animals and Man. By W. Kidd. Pp. xii+154; illustrated. (London: A. and C. Black, 1903.) Price 5*s.* net.

ALTHOUGH it is quite natural that every student should consider his own pet subject one of special importance, we cannot think that Dr. Kidd has sufficient justification for publishing a second work on the hair-slope of mammals, since the volume before us does not appear to carry the case materially further than was done in "Use-Inheritance." Indeed, since the author himself (p. 122) is fain to admit that hair-whorls, featherings, &c. (as he terms the various abnormalities in the direction of the hair) are variable, intrinsically unimportant, and even whimsical, we should have thought that enough had been made of them in the earlier work. If further evidence of their variability and slight morphological importance be considered necessary, we may refer to Prof. Ray Lankester's recent description of the condition existing in two specimens of the okapi, one of which shows a single and the other a double whorl on the forehead. If, however, the author and his publishers find the public sufficiently interested in the subject to absorb a second work, they have, from their own point of view, a sufficient justification for its issue.

Briefly stated, Dr. Kidd's theory appears to be as follows. In certain mammals, notably many long-bodied and short-limbed carnivores, and many rodents, marsu-

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